e-ISSN:2582-7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 4, April 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.521

International Journal Of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly Peer Reviewed & Referred Journal |

| Volume 7, Issue 4, April 2024 |

| DOI:10.15680/IJMRSET.2024.0704082 |

Railway Track Crack and Obstacle Detection

Meghraj Gadekar, Vaibhav Shinde, Ganesh Bachkar, Prof. Dhaigude N.B.

Department of Electronics and Telecommunications, SVPM College of Engineering Malegaon Baramati, India

ABSTRACT- Railway track safety is of paramount importance for ensuring the reliability and security of rail transportation systems The occurrence of cracks in tracks poses a severe threat to both passenger safety and the integrity of railway infrastructure. This research introduces an innovative and cost-effective solution for early detection of cracks in railway tracks using Arduino microcontrollers coupled with Infrared sensors.

I. INTRODUCTION

Railway tracks form the backbone of global transportation infrastructure, facilitating the movement of goods and passengers. Ensuring the structural integrity of these tracks is paramount for the safety and reliability of rail networks. However, the timely detection of cracks in railway tracks remains a persistent challenge, carrying significant implications for operational safety. In response to this challenge, this research introduces a novel crack detection system that leverages Arduino microcontrollers in tandem with Infrared sensors, presenting a cost-effective and real-time solution. Railway tracks go through a lot of stress from trains, weather changes, and other factors, making them prone to developing cracks. The usual methods we have for finding these cracks, like looking at them or using special tools, can be expensive and not always fast. Our idea is to use Arduino and IR sensors to create a system that can find cracks in real-time, helping us keep the tracks safe.

We want to make sure that train tracks are as safe as possible. Our motivation comes from wanting to create a system that's not only effective but also affordable. By using Arduino and IR sensors, we hope to make a system that can be easily added to existing tracks, improving safety without a hefty cost.

Literature Survey-

_EXISTING SYSTEM –

1.Eddy current testing in railway track

In order that maintenance can operate economically accurate results to the extent of damage caused by the fatigue cracks are demanded. With this information the grinding metal removal can be reduced and track wear minimised. During the last years an eddy current test system was developed and optimised at the BAM together with partners especially for the detection of damage caused by head checks. This measuring system is employed to obtain information with regard to position and damage depth.

II. PROPOSED SYSTEM

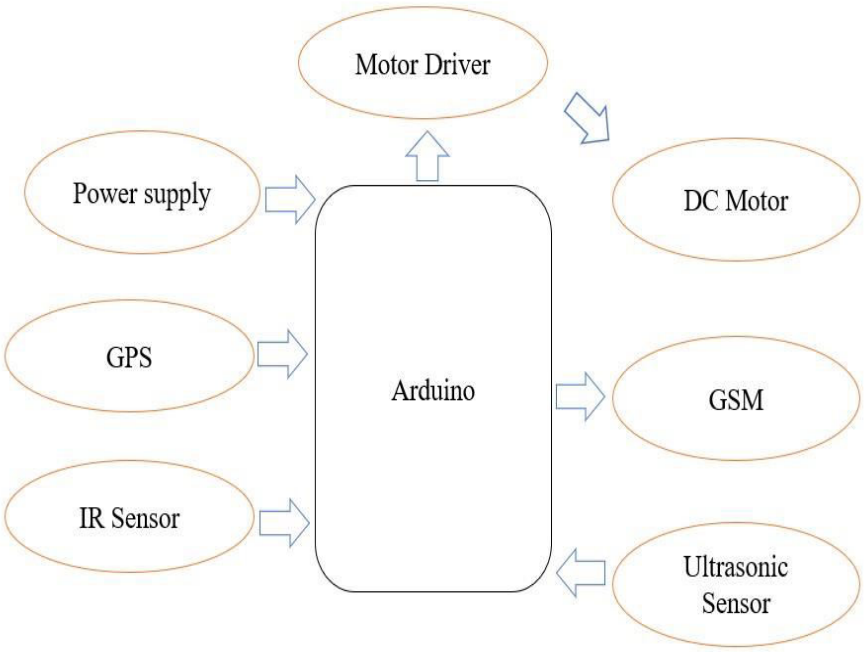
The proposed system revolutionizes railway track crack detection by employing ultrasonic sensors and Arduino microcontrollers. These sensors accurately measure the distance between two rails, detecting any minute variances that could signal a potential crack. Upon detection, the system swiftly relays the precise longitude and latitude coordinates of the affected area to the nearest station or control room using GPS and GSM modules.By leveraging advanced technology, this project enhances the efficiency and reliability of crack detection in railway tracks. It offers a cost-effective solution with heightened accuracy and time-saving capabilities, marking a significant advancement in railway safety measures

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly Peer Reviewed & Referred Journal |

| Volume 7, Issue 4, April 2024 |

| DOI:10.15680/IJMRSET.2024.0704082 |

Block diagram



Components Used-

Arduino UNO- Arduino is a versatile and user-friendly platform designed for creating prototypes, offering both hardware and software components. Among the various Arduino boards available, the Uno stands out as one of the most widely used options. It features 14 digital input/output pins, with 6 of them capable of producing PWM signals for precise control. Additionally, the Uno provides 6 analog input channels, a reset button for easy restarting, a power jack for external power supply, a USB connection for programming and communication, and other functionalities, making it a popular choice for makers and enthusiasts alike.

Motor Driver- The L293D is a common motor driver integrated circuit (IC) that enables the control of DC motors in either direction. With 16 pins, it can manage a pair of DC motors simultaneously, granting flexibility in motor control. This IC is capable of driving both small and large motors, thanks to its versatility. Its functionality is based on the H-Bridge concept, a circuit configuration that allows the flow of voltage in either direction.The L293D requires a voltage supply, denoted as Vcc, for its internal operations, typically at 5V. However, this voltage is not utilized for driving the motor. Instead, the IC features a separate provision, labeled Vss, specifically dedicated to providing power to the motors being controlled. This setup ensures efficient motor operation without interfering with the internal functioning of the L293D.

GSM- The SIM900 GSM module has been selected to enable SMS functionality in the project. A GSM modem, like the SIM900, is a specialized device that functions similarly to a mobile phone. It accepts a SIM card and operates through a subscription with a mobile operator. When connected to a computer, a GSM modem enables communication over the mobile network.Though commonly used for mobile internet connectivity, GSM modems, including the SIM900, can also handle SMS and MMS messaging tasks. This capability allows the project to send and receive text messages efficiently, enhancing its communication capabilities over the mobile network.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly Peer Reviewed & Referred Journal |

| Volume 7, Issue 4, April 2024 |

| DOI:10.15680/IJMRSET.2024.0704082 |

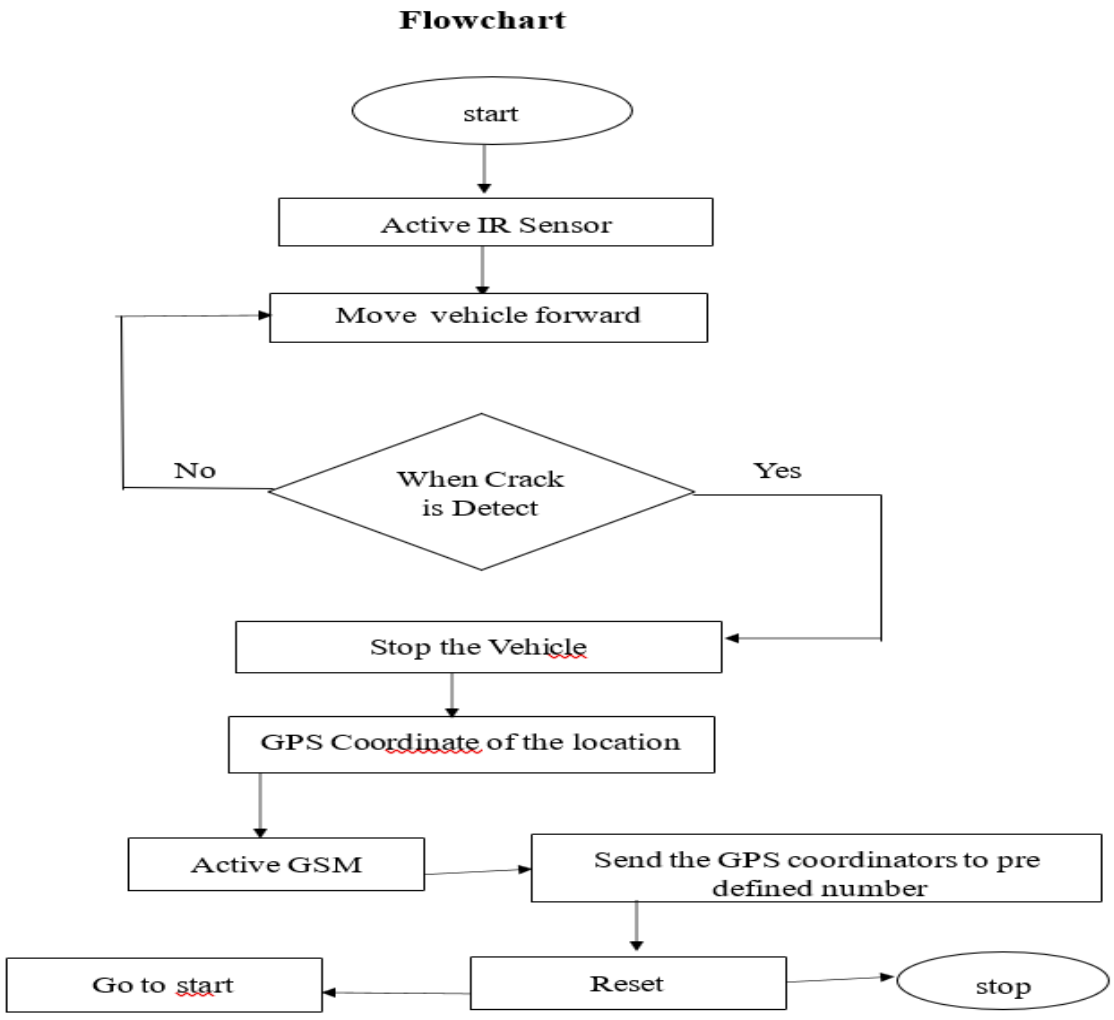
IR sensor-

The IR sensor array is a device with seven mounted infrared sensors. Each IR sensor is capable of detecting black and white colors. The array is capable of emitting sound. .The IR array can perform detection at proper distances. The infrared sensor transmitters or receivers have optimal operating range of 0 to 5cm

Ultrasonic distance sensor-The ping sensor, manufactured by Parallax, is an ultrasonic range finder designed to measure the distance to the nearest object in front of it, accurately detecting distances ranging from 2 centimeters up to 3 meters. Its operation involves emitting a burst of ultrasound and subsequently detecting the echo produced when the sound wave reflects off an object.The Arduino board controls the ping sensor by initiating a brief pulse to trigger the detection process. It then listens for a returning pulse on the same pin using the pulseln function. The duration of this second pulse corresponds to the time it takes for the ultrasound to travel from the sensor to the object and back. By applying the known speed of sound, this time measurement can be converted into a distance value, providing precise distance readings to the Arduino board for further processing and decision-making.

DC motor- The proposed design uses seven DC motors, of which 4 motors are of 60rpm, 2 motors of 10rpm and one motor of 200rpm. DC motor works based on the principle that when a current carrying conductor is placed in a magnetic field it experiences a mechanical force, whose direction is given by Flemings' left hand rule. These motors are interfaced with the Arduino with the wheel diameter of 5cm

Flowchart



| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly Peer Reviewed & Referred Journal |

| Volume 7, Issue 4, April 2024 |

| DOI:10.15680/IJMRSET.2024.0704082 |

IV. FUTURE SCOPE

Exploring the future potential, the utilization of wireless sensor network techniques promises to enhance railway track security systems significantly. These systems would operate by deploying sensor nodes along the tracks, continuously monitoring for any irregularities. Specifically, these sensors would be sensitive to vibrations caused by approaching trains, enabling early detection of potential issues.Moreover, integrating geographical positioning sensors onto trains would enable the transmission of real-time location data, ensuring precise tracking of train movements. It's crucial for this system to operate in real-time and adhere to predefined deadlines, ensuring timely responses to any detected anomalies.Innovatively, to bolster the crack detection system, the integration of an Anti-Collision Device (ACD), such as the one developed by Konkan Railway (KR), could be immensely beneficial. This self-acting microprocessor-based communication device is adept at preventing high-speed head-on collisions across various railway sections, stations, and level-crossing gates, thereby safeguarding lives.By incorporating the ACD into the crack detection system, an added layer of sophistication and optimization can be achieved. This integration would not only enhance safety measures but also contribute to the overall efficiency and reliability of railway operations, ushering in a new era of railway track security and collision prevention.

V. RESULT

The IR sensor is responsible for scanning and detecting cracks on the railway track. Once a crack is identified, it triggers the system to halt the vehicle. Subsequently, the GPS system activates to pinpoint the precise coordinates of the location where the crack was detected. Upon acquiring the coordinates, the GSM module takes over, transmitting a message to the railway control room. This message contains critical information about the detected crack, ensuring swift and efficient communication with the authorities responsible for track maintenance and safety.

REFERENCES

[1] Aniket Chakraborty, Shyamsundar Banerjee, Soutrik Karmakar , Koushik Das1, Susmita Das B. Tech Student, Electronics and Instrumentation Engineering, Narula Institute of Technology, India Volume 15, Issue 6 Ser. I Nov. – Dec. 2020.

[2] Disha Bhat, Nayankumar Khatawkar,Neelavva Kadli,Dheeraj Veergoudar B. V. Bhoomaraddi College of Engineering & Technology, Hubli-580031 Vol. 4 Issue 05, May-2015.

[3] Anika DEY , Hans-Martin THOMAS , Rainer POHL Federal Institute for Materials Research and Testing (BAM), Berlin, Germany 25-28 Oct 2008.

[4] Rijoy Paul, Nima Varghese, Unni Menon, Shyam Krishna K, “Railway Track Crack Detection”, International Journal of Advance Research and Development, Volume3, Issue3, 201

[5] Ramavath Swetha, P. V. Prasad Reddy, “Railway Track Crack Detection Autonomous Vehicle”, Global Journal of Advanced Engineering Technologies, Volume 4, Issue 3- 2015 .

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com